

Project: Adaptive and Informative Skin
Student: Jop Japenga
s051812
Coach: K. van Mensvoort
Theme: Next Nature
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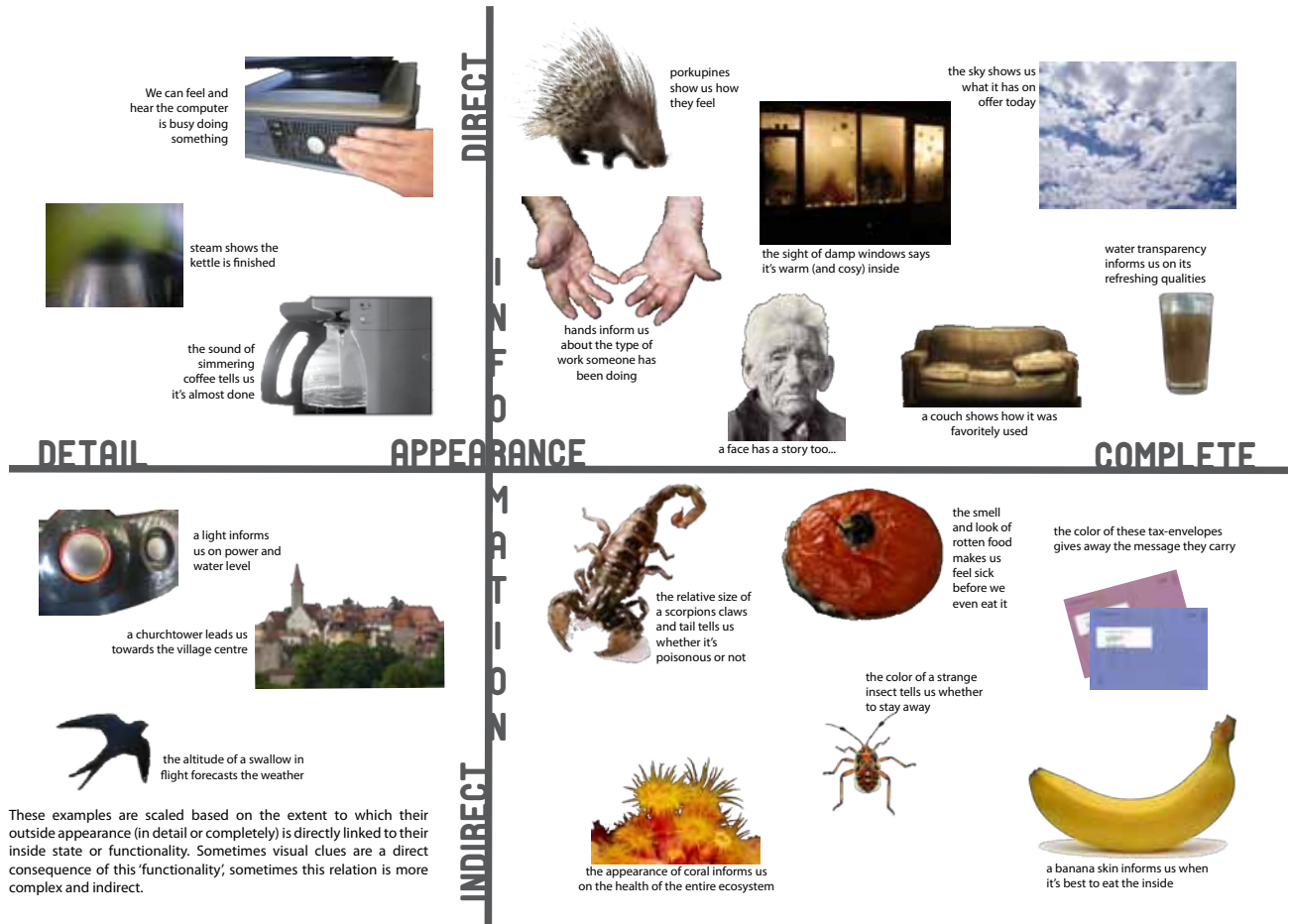
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INTRODUCTION

Adaptive and Informative skin is my first master project and therefore a design project. Because of my personal development plans and the way the project was set up with deliverables like advertisements and prototypes, the main focus of this project is on the competency areas of Ideas and concepts, integrating technology and form and senses. I aim to produce many visual outputs throughout the project.

This report is divided into two main parts. The first explaining the first part of the project, before the interim exhibition and the second part about the last. The first part describes the process from project description towards five concepts, and the second part is about taking one of those concepts to a working prototype.



INTRODUCTION

The natural world around us is full of signs, or at least we (humans) can find them everywhere. Over time we have learned to read our environment. From our perspective nature is full of information, displayed on the outsides of the subjects themselves. We can tell when fruits are ready to be eaten or whether to stay away from certain animals, merely by their appearance or 'skin'.

Human made objects are generally much poorer in the way they display information about their functioning. This information is

often communicated through tiny details like indication lights. In cases we have learned to perceive 'undesigned' signs from these products it is usually not through their visual appearance but through other means. This project aims to create new products that do have informative and adaptive skins. How can products change their outsides along with their insides? Do we need to learn how to interpret this information as we have done in nature?

a day in pictures

APPROACH

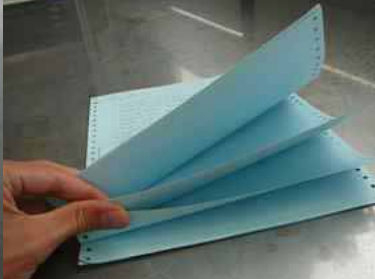
Initial brainstorming was done to grasp and explore the context of the fundamental principle of this project. No specific context had yet been defined in terms of users, markets or functionality which allows for great freedom but requires strong and clear (over)view from the designer. Many iterations were to be used to get this project specific enough to start prototyping in the second half of the semester. Widening the scope to make well considered decisions in order to widen again on the next subject. A perfect challenge for a design project.

Looking at the defining title of this project 'adaptive an informative skin', the first attempts were made to define contexts. These could be defined from the 'information' that was to be communicated, the products or situations that 'adapt' or the means by which this was communicated (skin). An example of such a context is 'direction', being information on where. These contexts in turn were input to brainstorms leading to shortly stated products (e.g. a prayer rug pointing towards Mecca).

Another approach towards product ideas was based on everyday products. A photo was taken of every object I used or saw for a whole day. Looking back at the pictures, a piece of information was considered for every single product used that could actually be useful or fun for that product to portray.

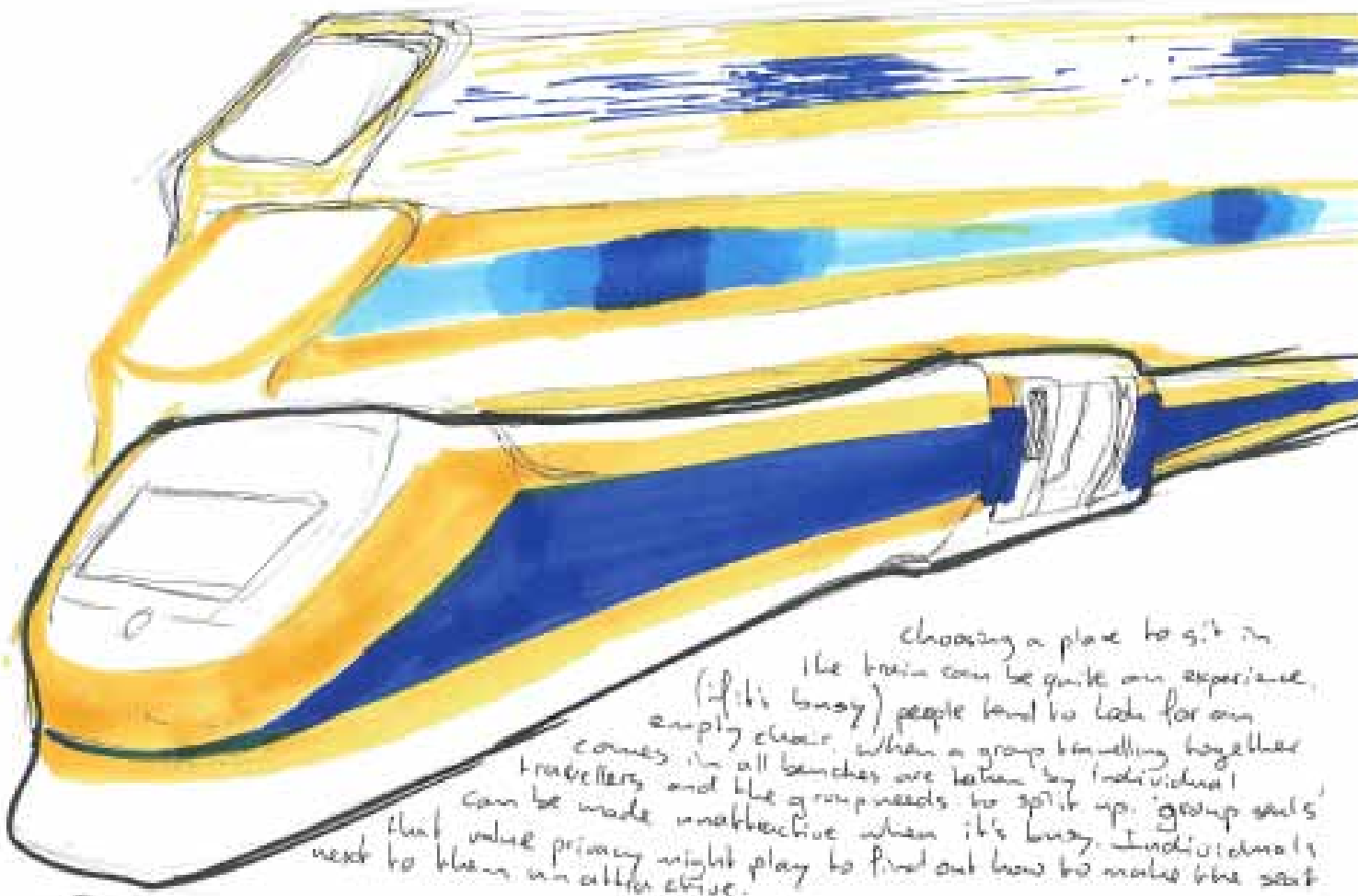
A selection of product ideas from these lists was explored through sketching. Different types of information or several ways of communicating through these products' skins produced more variation within each initial idea. After some discussion a final selection was made of concepts to be advertised.

In order to create advertisements making sense for each of the concepts, ideas on target group, the image to be used and the role of the advertiser were combined in sketch versions of the final concepts. Even during this process some of the ideas changed but it was mainly to rethink the purpose of each add.



IDEAS

In this next section five ideas will be discussed in more detail. These are the ideas that were chosen to be presented at the interim exhibition and for which advertisements were made. These advertisements will be shown, a short explanation of each idea will be given as well as the motivation behind the advertisements and future prospects within this design project for each of them.

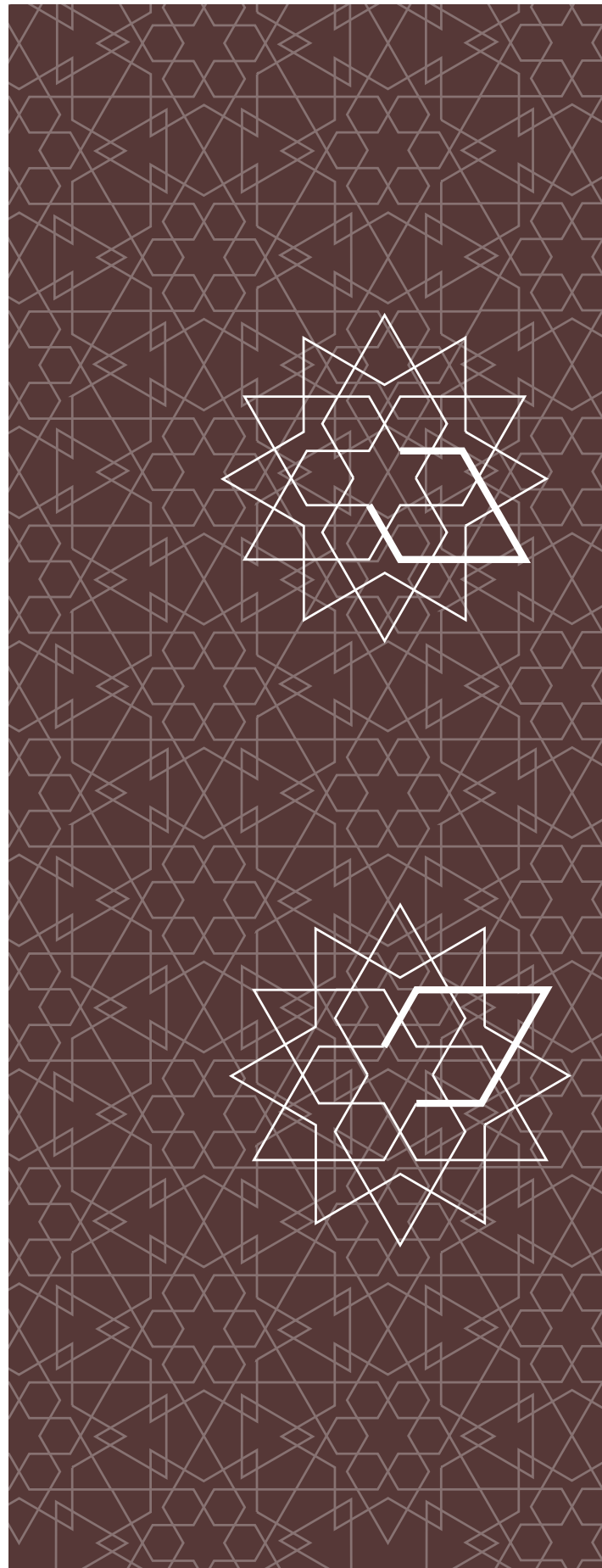


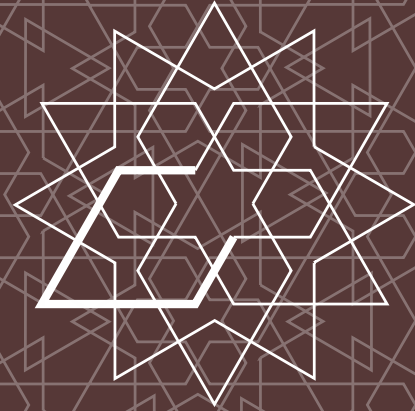
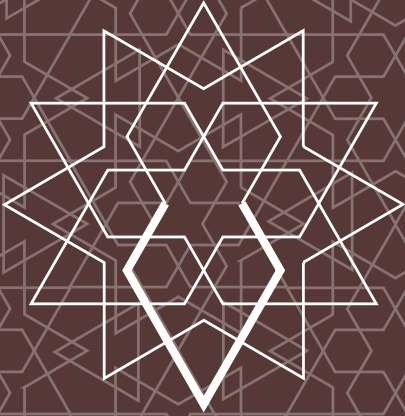
Muslims around the world direct their prayers towards their most sacred place, the Ka'ba in Mecca, Saudi Arabia. From their mosques, homes or workplace most will know this direction (qiblah) by heart but in case they are away from their usual surroundings and in a place where the Islam is not widespread, they might not be certain in which direction to pray. This prayer rug will show them just that, using the traditional arabic art of patterns.

In the pattern used to decorate this mattress arrow-like shapes in several directions are repeated. Different parts of this pattern light up depending on your position in order to direct you towards Mecca, wherever you may be.

In order to keep the advertisement clean, a background showing the pattern and font were used to attract the attention of the target group. Effects of the different arrows are shown and a descriptive tagline are used to explain what the concept is really about.

The relatively simple, yet interesting technologies (like illuminated wire and a digital compass) and the visual opportunities of arabic patterns would make for an ideal M1.1 design project. The religious context is also very interesting. It would lead to a product of high personal value but with a huge possible market. However, during the development of this advertisement a similar project was found on the internet [reference]. Although it does not use the patterns itself to guide the prayer, the combination of a digital compass and lights in a prayer rug took away the original spark of this idea.

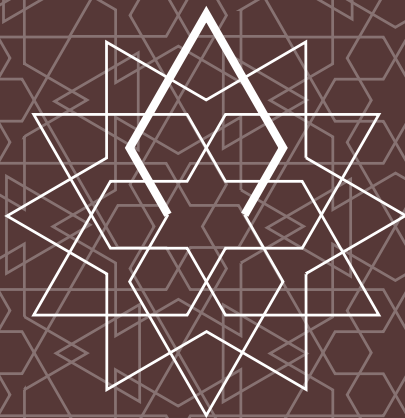
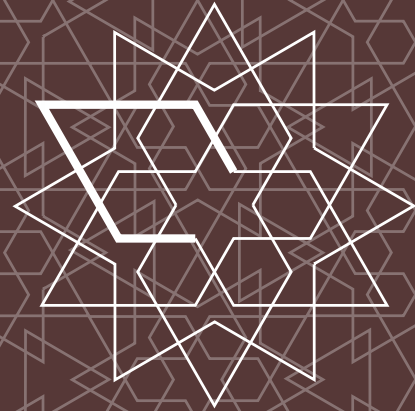




qiblah

Your guide to Mecca

A prayer rug guiding towards Mecca
with its pattern, wherever you may be






when
empti

this wheely bin fades in with its
background.

BIN THERE.

A black trash bin is positioned on the left side of the frame, set against a red brick wall. The bin is a standard, rectangular, wheeled trash can with a dark lid. The brick wall is composed of reddish-brown bricks with visible mortar lines. The ground in front of the bin is paved with grey stone tiles. The overall scene is outdoors, likely in a residential or public area.

the time has come to be
ed it wil show itself.

Whether they are kept in private backyards or out on the streets, wheely bins are generally unattractive to look at. But take a random neighborhood and these trash cans are a regular sight. BIN THERE is a concept in which the wheely bin fades in with its background, much like a chameleon does. Except for the day it needs to be picked up for collection. This way it will stand out not to be forgotten.

In earlier versions of this concept, other visualizations for the surface to show were explored. Such as the bin showing the type of waste going in, the extend to which it is actually full (air inside packaging takes up lots of space) or the date it will be picked up. The relation between the beauty of the information decoration on the outside of the bin and the waste that is actually inside was of particular interest here.

The image chosen for the advertisement was pretty simple and clear, as the function of this product is quite straight forward and practical. This advertisement is the only one which has clear explanatory text.

The challenges in technology and market implementation that the project would face in with this idea are huge. Displays on such a surface and the technology needed to sense the human perspective in relation to the bin will be rather expensive. Since no one would actually be willing to pay that much for a bin, prospects for this idea are rather slim.

A million people a day travel by train in the Netherlands alone. As the rain arrives they try to estimate the exact position of the doors once they've stopped moving. Even though everyone waiting on the platform is concerned with having a seat, it is clear that certain areas on the platform are far more popular than others. While people struggle to get a seat in one carriage, a few coupés down there's plenty of room.

In this concept a train shows the inside activity on its outside. The number of taken seats inside the carriages will be represented in the (iconic NS) blue bar around the windows. Standing on the platform, one can now distinguish between the busy and quiet carriages and decide where to enter. Every seat represents a specific piece of skin on both sides of the train.

The sender of this add would be a railway operator, in this case the Dutch one. Since it is not a product consumers buy, the aim of this advertisement is rather to introduce this new service, changing the consumers' view on the service they provide.

As with the 'bin there' concept, similar arguments concerning the future of this design project apply here. Such large scale concepts would not make a particularly nice design project. However, the effects of such a concept on the crowd would be an interesting subject for a more research based project.



2



cial?
oice



2







skin
enlive your music

Listening to music has the power to change the way we perceive the entire world around us. Using headphones this becomes an almost secret, private world in our complete control. This concept proposes headphones that change their appearance as the music played on them changes. Thus giving a slight hint towards the kind of atmosphere we're in.

These headphones have a skin of scales which react to the style of music. A quiet and dreamy tune could result in subtle movements in the scales whereas party music would result in far more energetic behavior.

In order to link the difference in atmosphere to the changing headphones, the advertisement consists of two faces with different expressions and matching headphones. This product would be targeted at young people, wanting to express their identity through this 'fashion accessory'. For this reason the advertisement is not too explicit but also aiming to create a strong atmosphere the target group can connect to, much like perfume ads.

This concept is different from the others in the way it uses its skin, not displaying patterns or colors on a 2D surface but actually moving in space. It would make an interesting design task to create a working prototype for this kind concept.

Grocery shopping is a regular activity in our lives. Yet the products we buy are often the same and the activity of buying them in itself is rather boring. This concept is about a shopping basket that displays information on the products it holds.

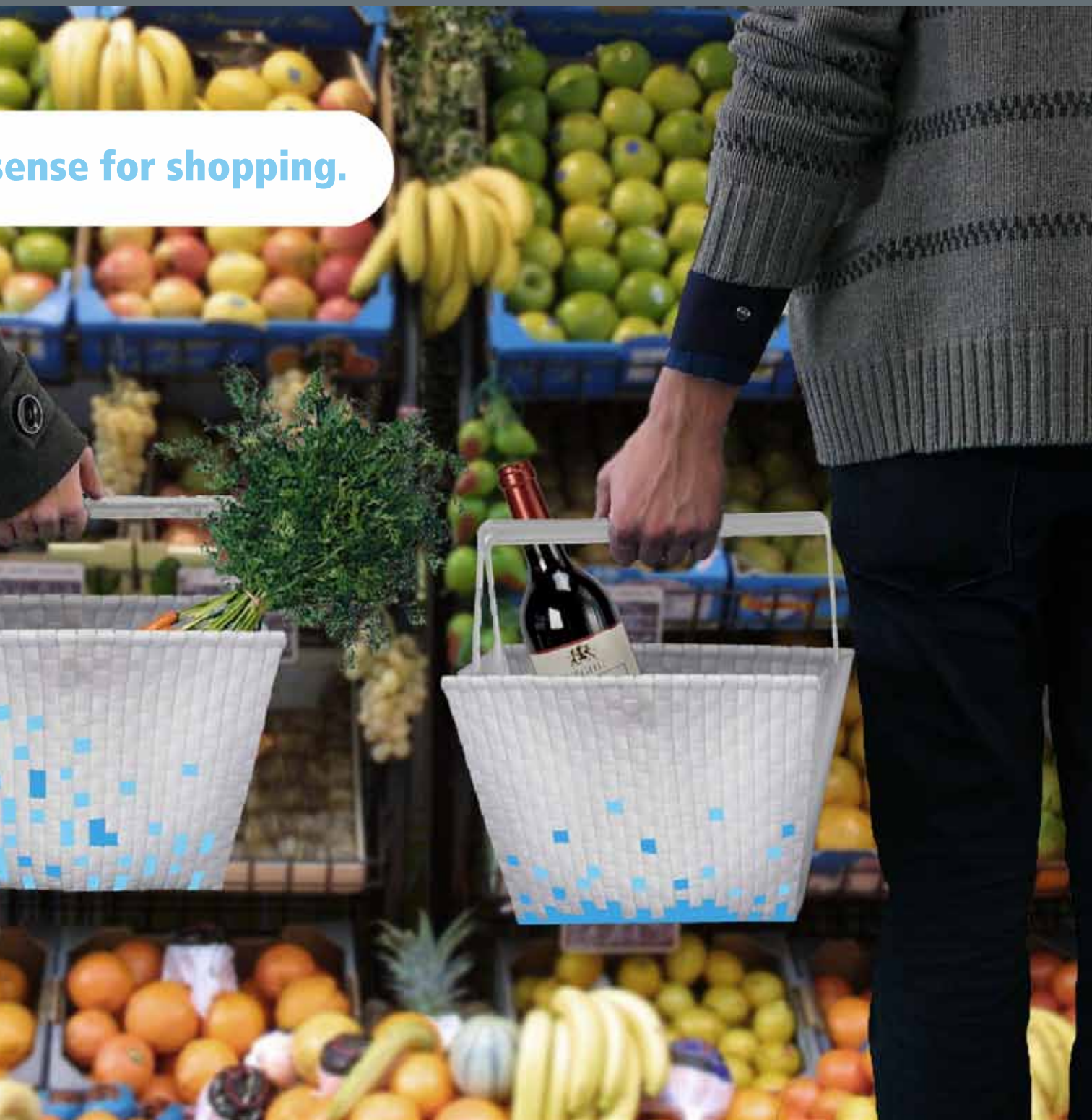
Product qualities like price, expiry, weight and nutritional values will be used in different combinations at every use. As this information changes, it remains a surprise what pattern will show. This way the shopper can explore the nature of the basket and find a way to use it. Unlike most other concepts this product might require a process of learning before the information it provides can be useful, just like signs on natural products usually do.

Since magazine advertisements on such products would come from supermarkets, an existing brand was used to clarify the context of this concept.

Continuation in this direction would have a great focus on the kind of interactions this would trigger between people in the supermarket. What do we want others to see about our shopping and what do we want to see ourselves (e.g. on the inside of the basket)?



ense for shopping.



CONCLUSIONS

During the exhibition visitors were asked to vote for their personal favorites in order to provoke discussion about these concepts. The headphone concept was most popular, probably because it was a product most people would like to buy themselves.

Being such a gadget, I feel it is also the most interesting option considering this is my design project. In creating a prototype for this concept I expect a challenging process of exploring technology within design.

Feedback on the quality of the advertisements themselves indicated they should be much clearer in communicating what they are actually about. In some cases the object itself is not even shown and although these objects did not really exist, simple simulations would make a much stronger add. The use of names and tag lines should also be improved, a clear and well thought through aim will help.

squamata

INTRODUCTION

As the concept of headphones with scales moving to the music played on them was chosen, the road towards a working prototype was still long as the concept was purely theoretical. All specifics still had to be defined and an approach of exploring iterations (samples) was to be used to decide on the physical side of prototyping. Literature was used to specify the context and the relation between music and moods in support of the concept.

This part of the report will first explain the context and working of this final concept. Several inspirations and explorations will follow to give more insight in the process towards the final concept, from here on called Squamata. An explanation of how the prototype was created and a short discussion of future prospects for this project are found at the end of this chapter.

CONTEXT

Just like a recently lost loved one or a fresh new love have the power to completely change the way we perceive the world around us, listening to music can create an extremely strong personal atmosphere and has great influence on the listener's mood and thoughts (Saarikallio et al., 2007, Bull, 2000). A world full of beautiful people or an entire universe conspiring against you, they can be just one click apart.

A train carriage is filled with dozens of different atmospheres. It is the personal control which makes personal music players such a huge success (Kahney, 2004). This means control over space, time and interaction with others. It helps us walking a scary street alone at night, forgetting our sorrows or laughing at the sight of pigeons. Using a personal stereo allows us to make up stories, construct narratives with the things and people we see and the music we hear. It allows us to feel as if we were outside of reality (Schönhammer, 1989).

Wearing a headset tells others that you're minding your own business and that they should too. These effects are so strong that it's even more accepted to stare at strangers as it gives you the excuse that you're actually thinking of something else. After the introduction of the Sony Walkman in the 1980's listening to personal music in public was considered rude and a sign of decline of intellectual culture (Schönhammer, 1989). Since then listening to music privately has become

widespread and socially more acceptable. It is now time to open a small peephole into our private atmospheres.





CONCEPT

Squamata is a set of headphones that uses its skin of scales to indicate the atmosphere of the music played on them. These scales do not literally respond to every beat of a song but they slowly shift between appropriate states as

the songs go by. It functions as a visualization of ones mood triggered by music rather than the actual song itself.

 SQUAMATA



mu
un

Squamatas owner remains in control of the situation, might not even notice the movements on his head. Its behavior is aimed at the people around, rather than the wearer himself. These headphones grab the attention of passers by and

share parts of the music listening experience. People would actually want to buy it as a fashion object, as a means to show their identity.



music is alive
leash it



snake



bird of paradise



Several inspirations were used as an input for further development of this concept. Besides natural beauty, a number of human projects were also of particular interest while exploring the possibilities of this project.

Looking at the way animals use their skin is a great way to start developing your own. Where some animals use their skin for beauty, others, like the porcupine use it to scare of potential enemies. The way the porcupine changes its entire appearance the moment it sets out its spikes is unbelievable, it even seems to scare off lions. It is a great example of how skin can communicate a changing mood.

Bart Hess created a line of textiles that are much like furs. The textiles are of outstanding beauty, communicate powerful atmospheres and set an example for man made, pretty skins. Another design project that was quite relevant to this one, in a whole different way, is the fear enduser by Jurgen Westerhoff. This project is interesting because it is about the effects of sounds on the way people experience the world around them.

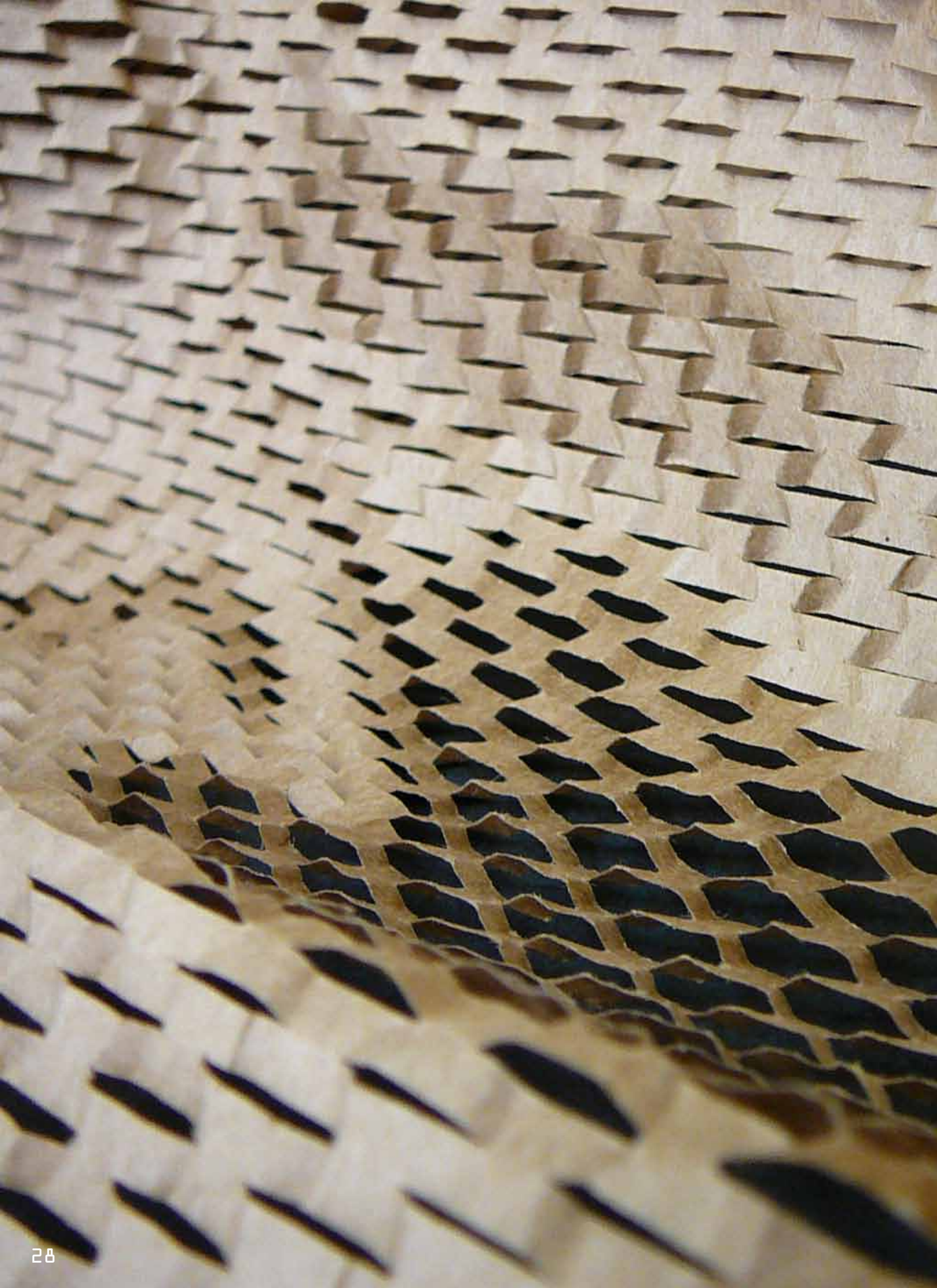


from outer space

INSPIRATIONS

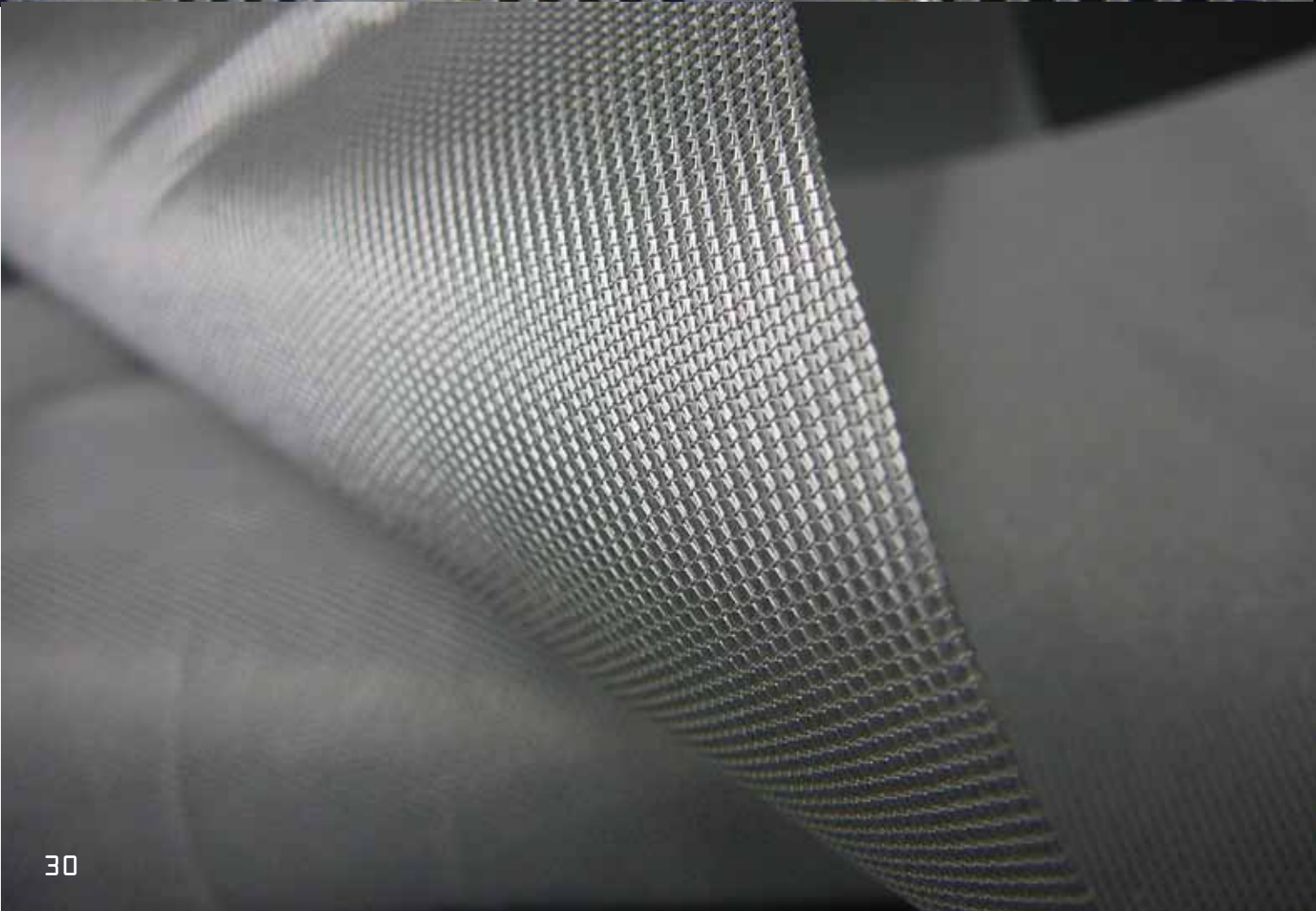
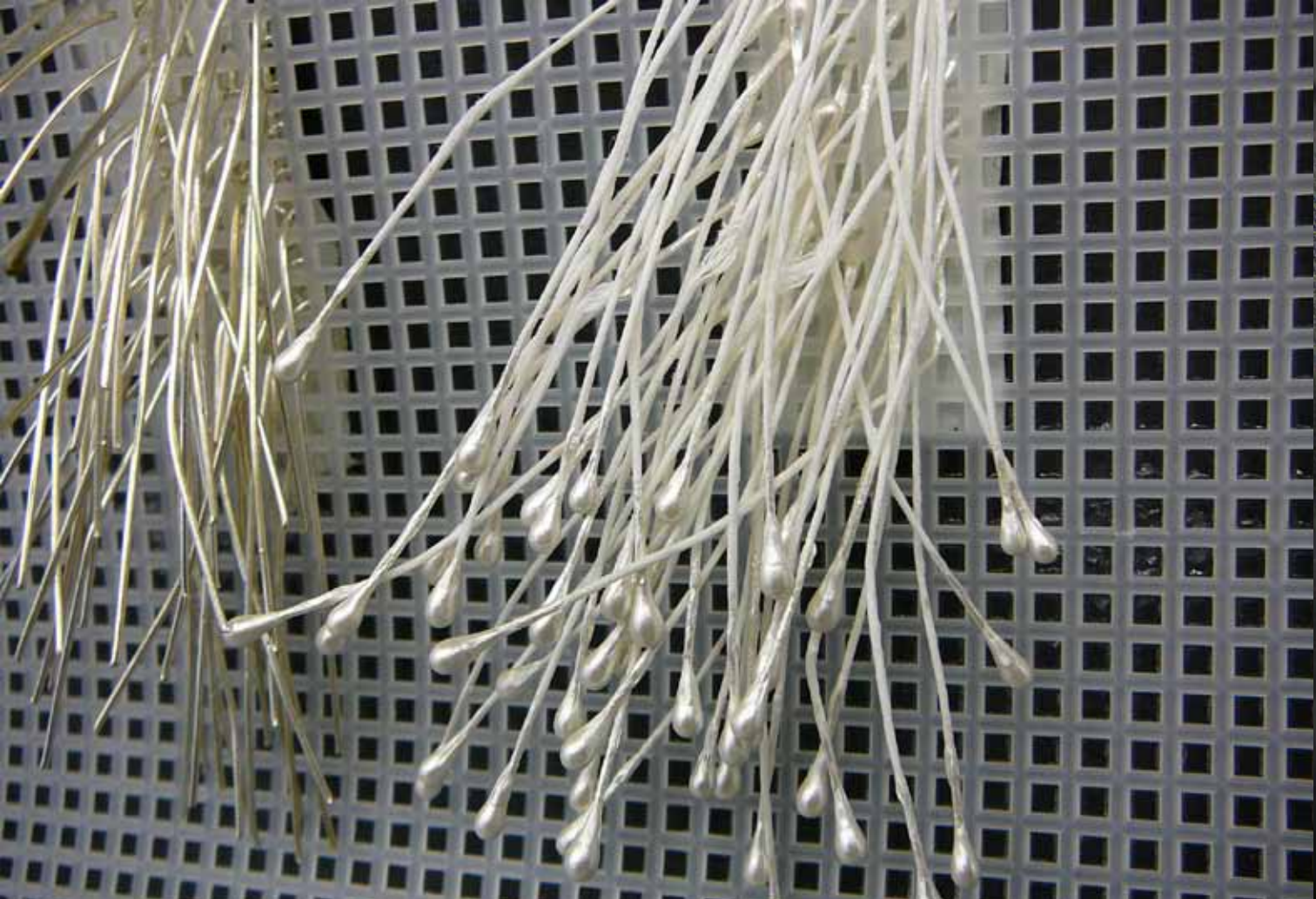


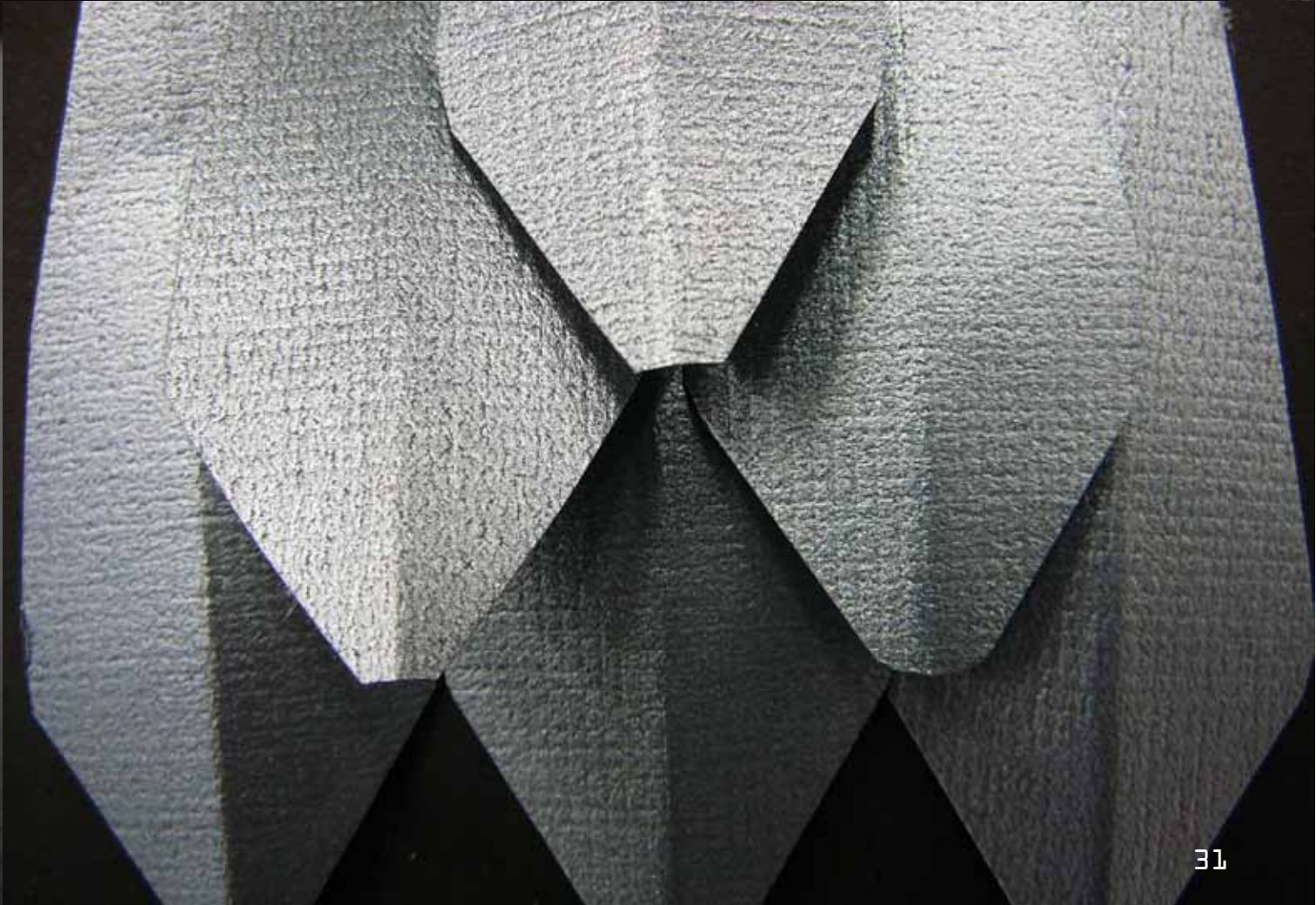
from the ocean: fish scales



EXPLORATIONS - SKIN

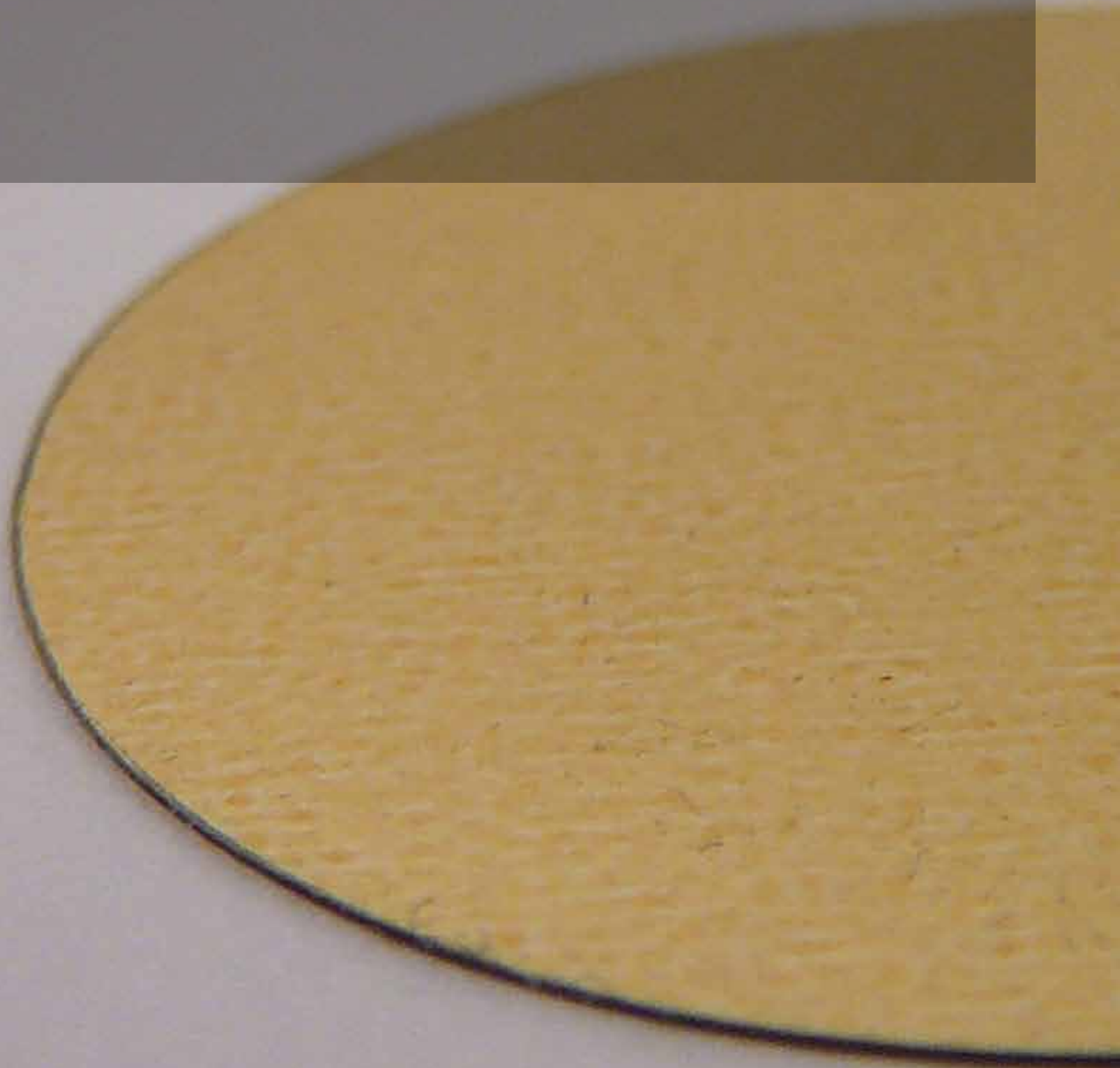
Different samples were gathered to determine what would make for a great skin. Considerations were the possible movements and expressions the type of skin could convey. Looking at the porcupine for example the length of its spikes allowed him to use them in an impressive move. Comparing, hairy surfaces with spiked and scaled ones, the reptile based scale shape was the best option. It was big enough to show considerable change and the overlapping scales resulted in quite a flat surface contrasting with the spiky appearance of the same scales in upright positions

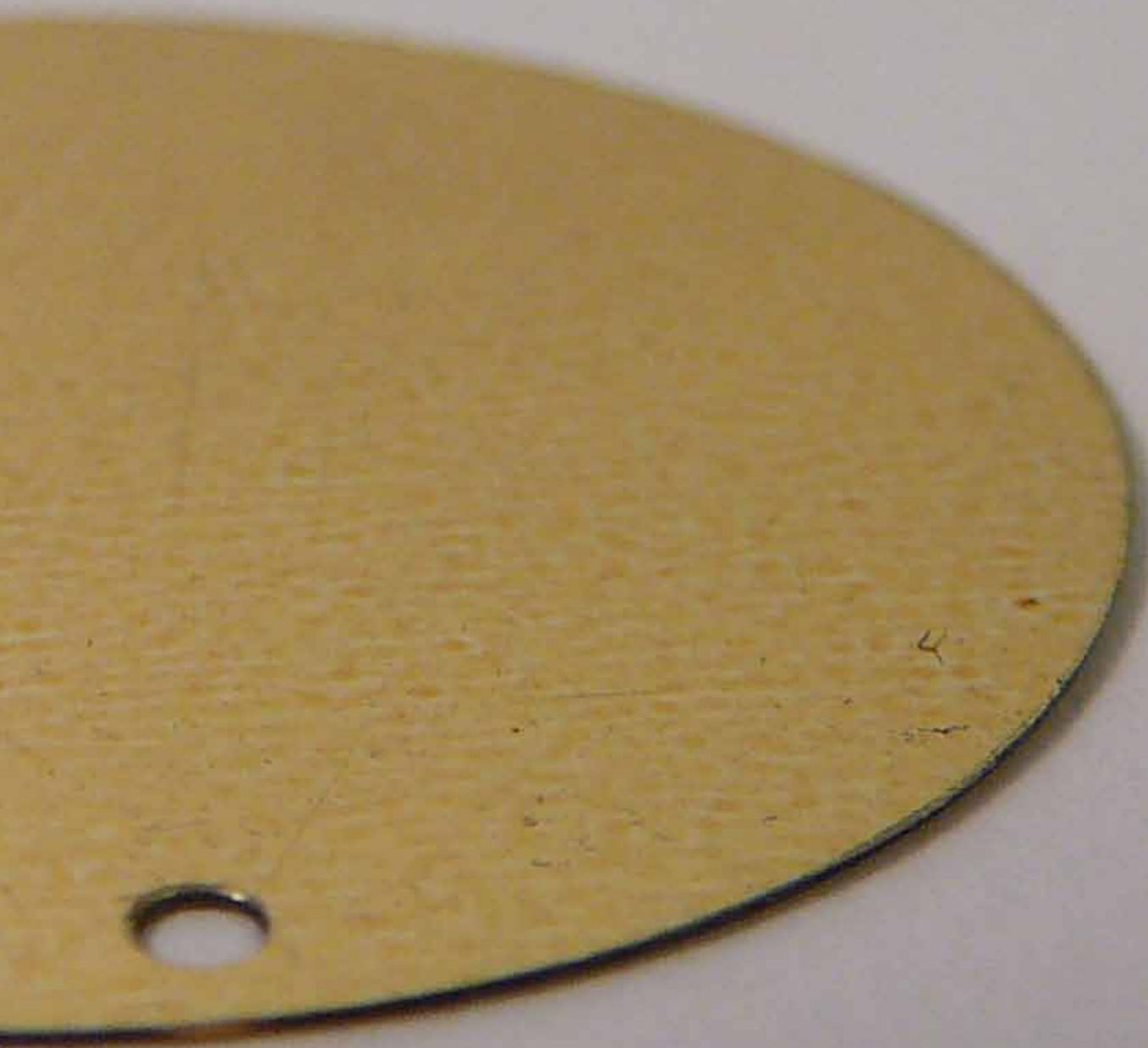


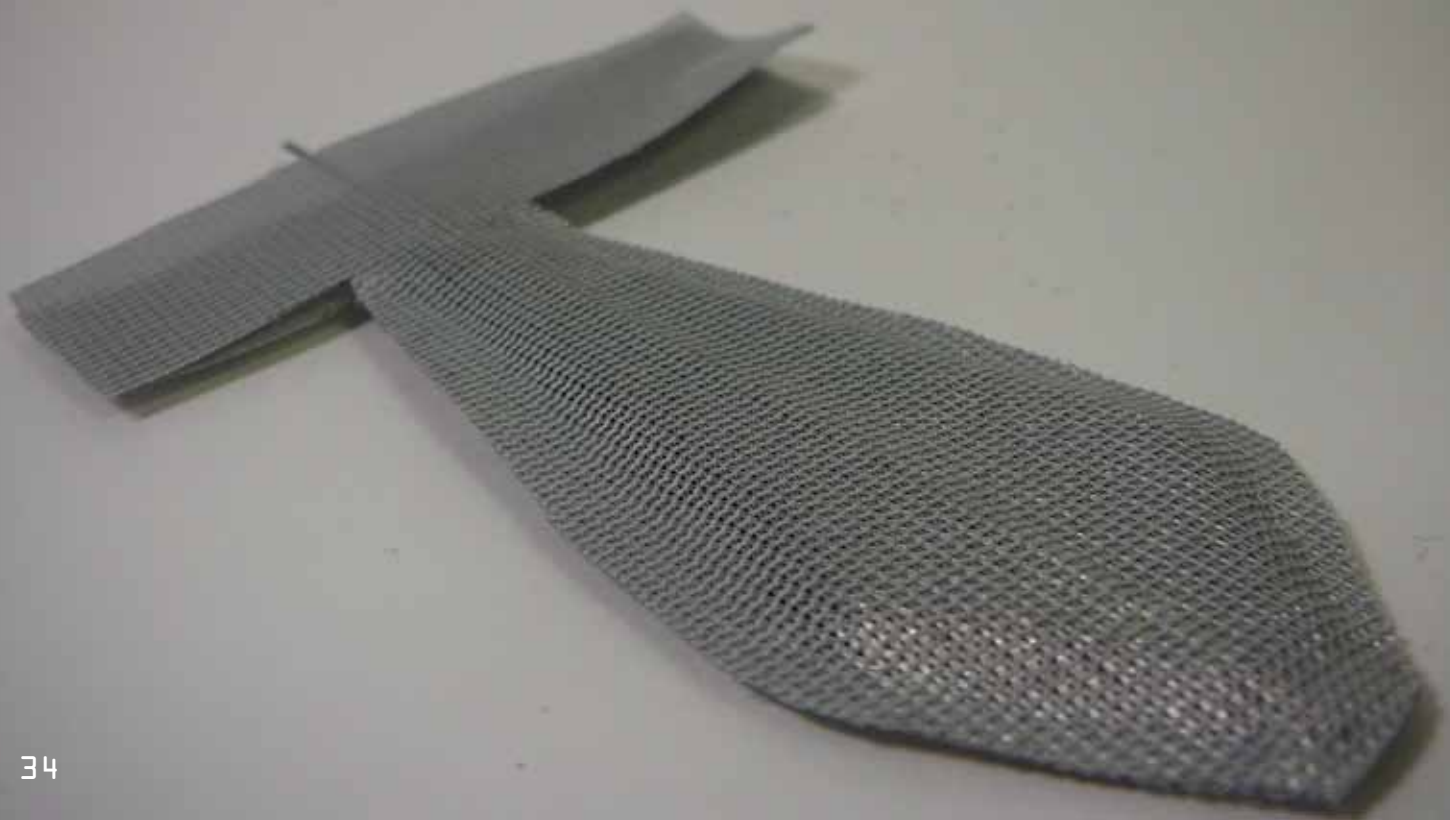


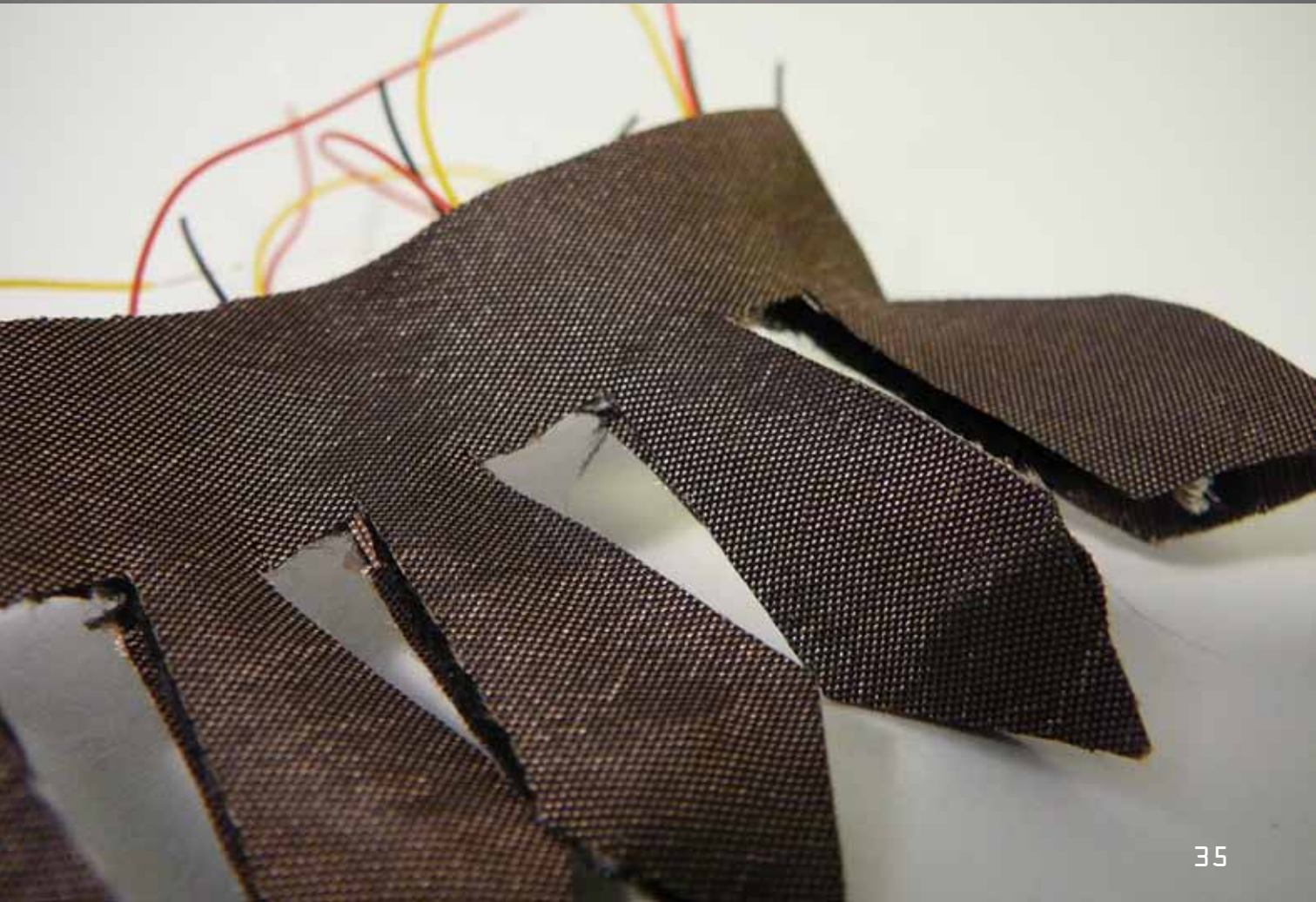
EXPLORATIONS - SCALES

Several shapes were compared to determine the ideal scale. Important factors here were the shape of the scale and its material appearance. As discussed previously it is desirable to have a shape which can express multiple emotions, one that can strongly change in appearance. In order to create a fashionable object, it has to be beautiful and because it is aimed at communicating with others the scales should somehow catch ones eyes. A reflective material will 'spark' as soon as even minor movements appear in the headphones.












EXPLORATIONS - MEMORY METAL

Nitinol shape memory alloy was chosen as the actuator material behind the movements in Squamata. It was selected for the interesting way it changes shape and how it can be used so locally since there were going to be a lot of scales on the headphones. There are quite some different types of this special metal and since it not yet widely available it was quite a challenge to find the right type. An approach of many tests made me slowly get a feeling for this material.

The material was formed under high electrical currents, the heat of gas flames, responses were hard to predict and far from consistent. For those reasons the nitinol wires are now used untreated. That means that they will want to become straight when heat or current are applied.







EXPLORATIONS - HEADPHONES

Different shapes were designed for the actual headphone. After a series of sketches, some of the shapes were cut from paper to be tried on a human head. In order to determine the positions of the scales, the paper shape was cut into 16 layers. Each one got covered in scales of a range of sizes, starting small at the sides and growing bigger towards the center.

MUSICAL AND MOODS

In order to visualize the atmospheres we get from listening to music these moods first need to be identified. Although personal tastes and preferences of music greatly differ humans are known to connect certain musical qualities to moods. Different melody contours, pitch scales, tempi, and loudnesses are known to result in different emotional responses (Chia Chu Liu, 2006). However, it is still hard to have computers recognize these.

In an emotion classifier by Thayer (1989) two axes split moods into four groups. Although arousal and valance in music might feel clear to our ears, it is difficult to identify especially valance from its factual signal. In their research after the connections between psychology of music Farnsworth(1958) defines 13 groups, each representing a set of emotions. Six supergroups can be comprised out of these:

1. happy, cheerful, light, gay
2. dreamy, graceful, delicate
3. passionate, longing
4. frustrated, agitated
5. spiritual, mysterious, sacred
6. dark, depressing, sad

A number of software products on the market today offer mood based classification. These are often based on a combination of signal processing itself (on a number of properties like e.g. tempo), a database updated as other people use it and id3Tag information in which mp3's store their title, artist and also genre.

A system similar to these will be used for this concept. Through a program that can be uploaded to any mod-

ern portable media player, the different scales will be triggered to move. However, for prototype purposes mp3 tags will be used to trigger action.

BEHAVIOR OF SKIN

The way scales actually move will express a certain mood in the end and are therefore critical for the effects of this product. The actual look of the design and the way that scales can be controlled are very important for the messages they can spread. In order to make well funded decisions on which kind of movements communicate which moods, a working prototype should be used to test what are common perceptions.

In building the prototype it was decided to steer rows of scales independently. To allow for reasonable effects without wiring every single independently. The prototype has six different modes based on the six supergroups as proposed by Li, simplified to one of the key emotions. This is how they react to music being... :

happy: rows quickly get up randomly and then go down again.

dreamy: slow wave on which the rows move up and down from the bottom up.

passionate: quick small movements, with larger swings every now and then.

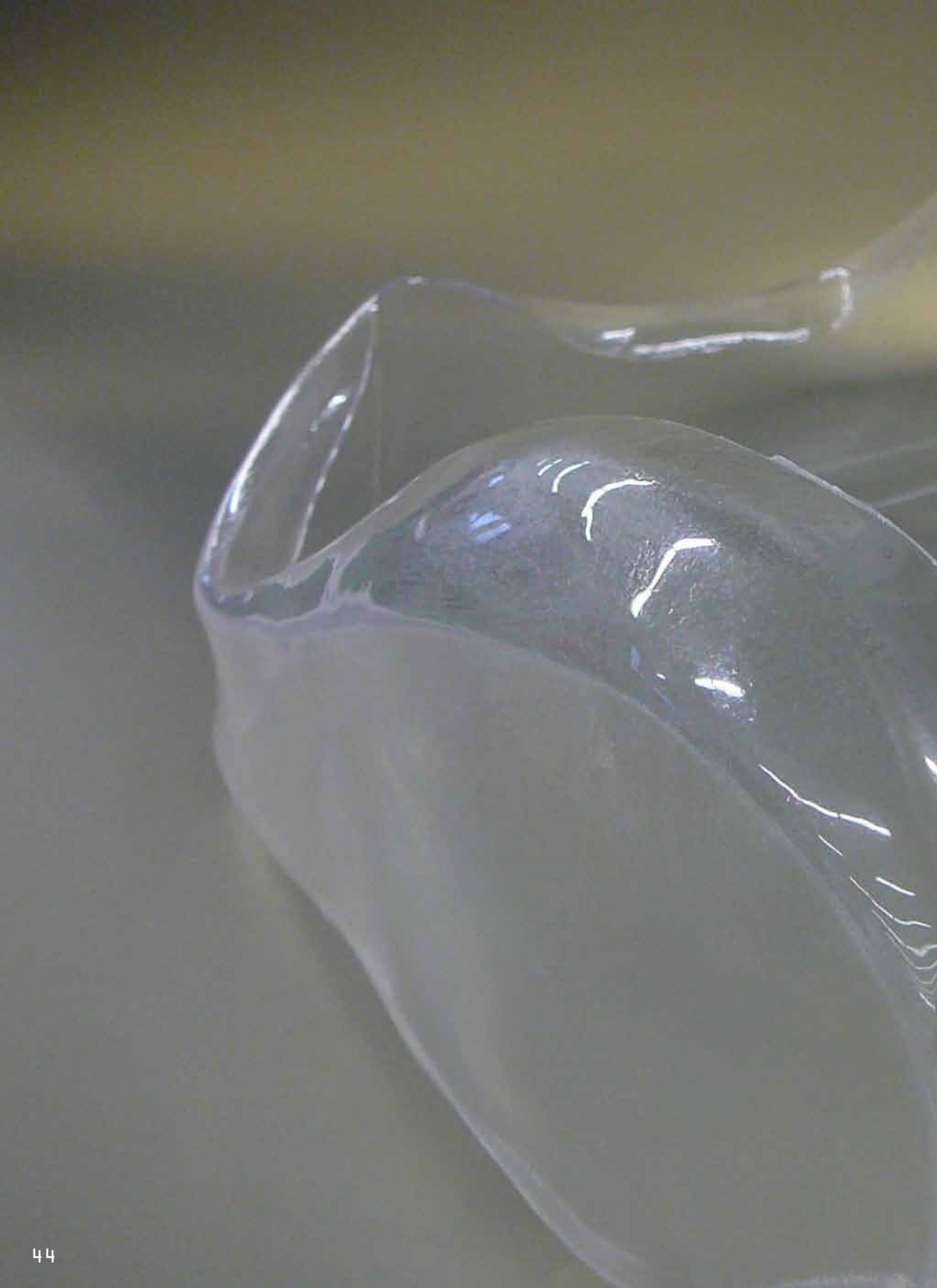
angry: all rows get up forming spikes.

mysterious: slowly moving up and down in random positions.

sad: slowly moving like a crying person. Moving in short, shocking movements on a slow rythm.



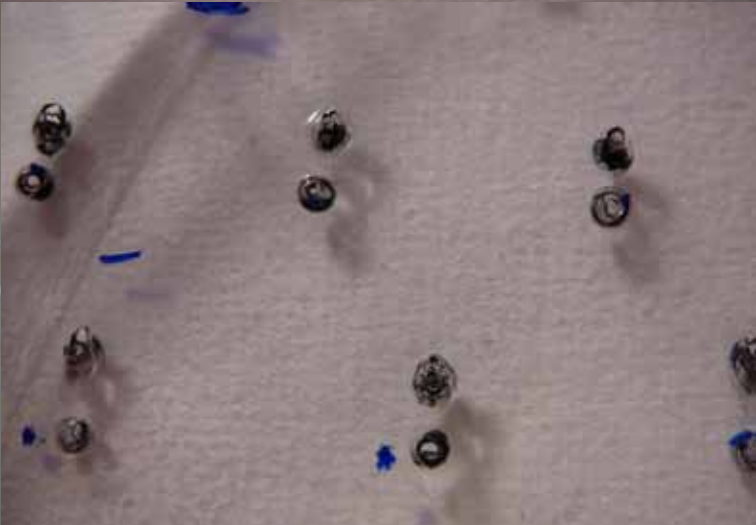
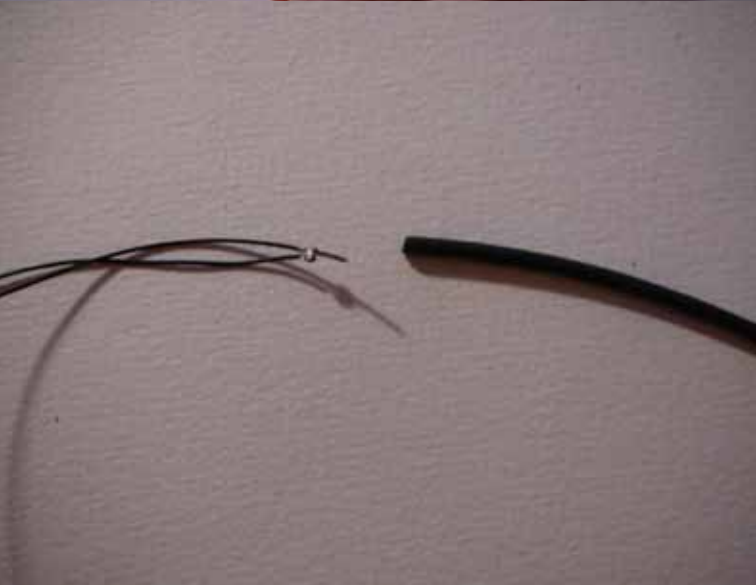




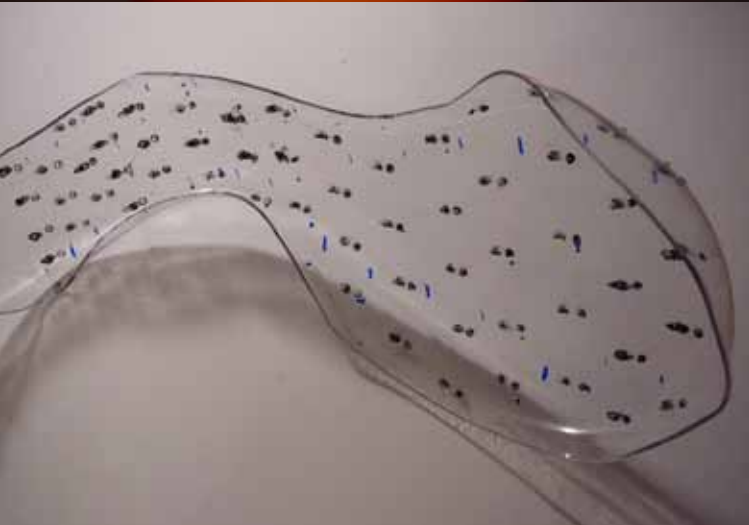
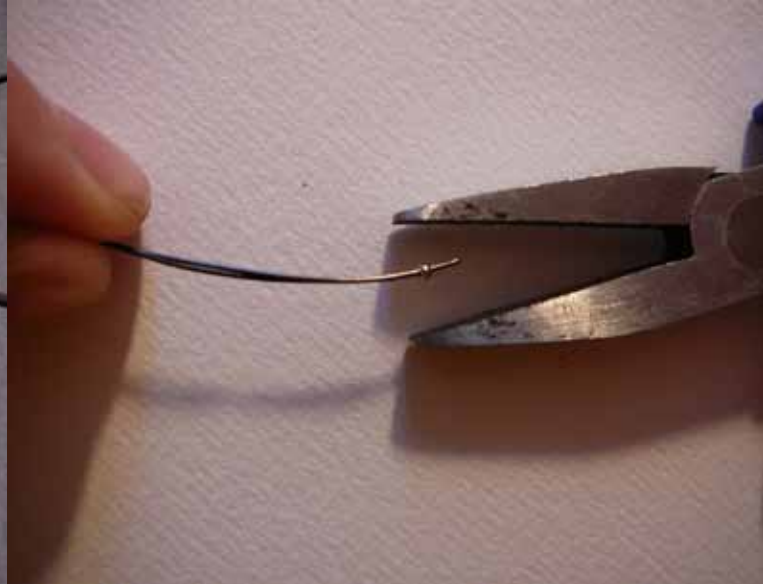
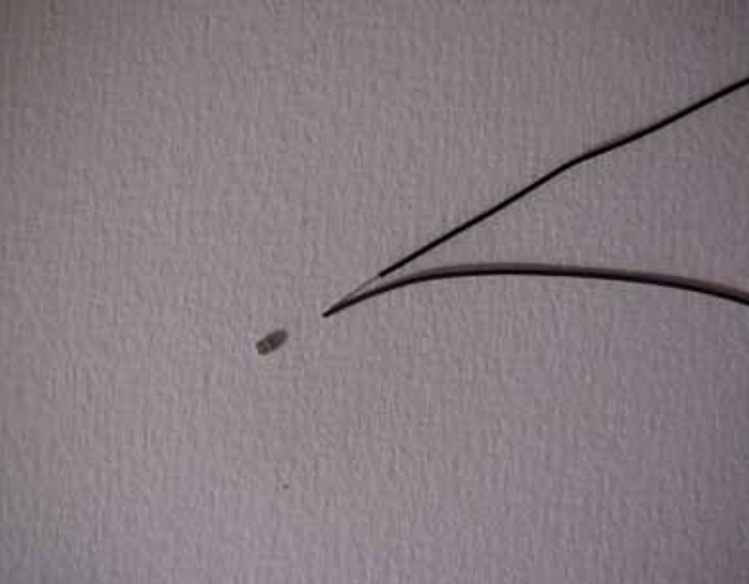


PROTOTYPING

Based on the material tests earlier on, a full scale prototype was created for purposes of presentation of the concept. It consists of a music player on a computer in which a song can be selected and a set of headphones that respond by moving the scales of its skin. A description of the building process will follow.



PROTOTYPING





PROTOTYPING

To create the required movement, nitinol shape memory alloy was used. When heated (or under high current), it straightens. The wire was cut in different sizes to support the different sizes of scales to be used. To create electrical connections pieces of kynar (which are thin and allow relatively high current) wire were connected. Since soldering tin does not connect with nitinol, all connections in the prototype were created using small beads squeezing the wires together. The part of the nitinol that was to be on the outside of the headphones was insulated with shrinking socks.

To attach the nitinol wires and let them take off, a plastic base was formed. A flat mold was built from mdf in the outlines of a cardboard test, with sanded smooth edges. This mold was used to vacuum shape a sheet of 'vivak' which could later be heated and bent into a shape that fits around a human head.

Holes were punched in the plastic base for the prepared pieces of nitinol to go through. For each scale two memory wires were used, one to push the scale up, one to pull it back down again. Nitinol wires were pushed through these holes, and attached on the inside of the base. The scales of one of fifteen rows were connected in series with each other and the same row at the opposite side.



PROTOTYPING

The material chosen for the outside was cut in the scale shape, in five different sizes as defined. After the base was painted black from the inside (to create a shiny black outside), all scales were glued on their respective nitinol wires.

Using Processing open source programming and its minim library, a small music player was created that sends its genre tag over the serial port whenever a song is played. This signal is sent to an Arduino micro controller in order to steer the rows of scales. A circuit uses a combination of shift registers and MOSFETs to connect or disconnect the series of wires to an external power source. The four shift registers allow the Arduino to control 32 separate outputs with just five pins. These low power output signals can activate the MOSFETs to allow the higher current to flow through the nitinol.

PROSPECTS

With the rise of mp3 a lot of the aesthetics has moved away from the music itself towards the devices that play them (kahney, 2004). Where albums with their covers used to be important as an image of style before, today it is more the ipods that play them that also function as fashion objects. As a result of this shift and the widespread illegal downloading of music this is also where people spend their money. New and remarkable products will enter the market, and a new concept of headphones like this could very well fit that need.

The nitinol used for this prototype needs considerable current to function and will therefore not be a realistic option for a real product. Other types of Nitinol however respond to much lower currents and could be an option. For this prototype they were not considered because the desired quantities would surpass the budget.

CONCLUSIONS

The several explorations that preceded the building of the prototype were a great way to approach this project. I believe it makes my project much more presentable and valuable for my portfolio. Producing physical results while working on the project I was stimulated and motivated to keep trying new things. For me it turned out to be an effective way of working on a design, in taking a basic concept towards a working prototype.

Personally I would be interested in the effect such a set of headphones would have in public space. If it would lead to less frustration towards the private music listener or maybe even less isolation. I would be interested to see how people perceive different settings of the scales and if that would also alter their perception of the person wearing it. Maybe even their willingness to approach that person. These are all topics that could be further explored was the project more research based.

The nitinol used turned out to be quite a difficult material and the electrical power needed make it an unlikely choice to create actual products. However, since this was a design project the struggle in working with it really improved my understanding of this material and the way to tackle unfamiliar materials.

Evaluation

As a design project for M1.1 personal development through this project was mainly focused on ideas and concepts, integrating technology through building a working prototype and visually attractive design. By setting these aims Interesting themes that came up later on in the project were left quite untouched.

Even though I chose not to take this research into much depth by performing e.g. user tests and observation, I gladly notice that the interesting topics surrounding this project (as stated in the conclusions of the previous chapter) do actually match my personal, sociocultural interests. I think it shows that I approached the project using my identity, not only on the parts of my current focus, but over the project as a whole. I am also interested to see how a research project (e.g. one in the coming semester) could also be influenced by my designer identity.





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